UEI841 ADVANCED CONTROL SYSTEMS

L	T	P	Cr
3	1	0	3.5

Nonlinear Control Systems: Introduction to Nonlinear systems, Liapounov's method for stability study, Phase plane method, Describing functions.

Optimal Control Theory: Introduction, Optimization by steepest decent method, Optimization with constraint gradient method, Minimization of functions by neumerical methods: Fletcher–Powell method, Newton–Raphson method; Optimal control problem: Characteristics of the plant, Requirements of the plant, Plant data supplied to the Controller; Mathematical procedures for optimal control design: Calculas of variations, Pontryagin's optimum policy, Bang–Bang Control, Hamilton–Jacobi Principle, Dynamic Programming; State regulator problem, Parameter optimization.

z–Plane Analysis of Discrete–Time Control Systems: Introduction, Impulse sampling and data hold, Obtaining the z–transform by the convolution integral method, Reconstructing original signal from sampled signals, The pulse transfer function, Realization of digital controllers and digital filters.

Design of Discrete–time Control Systems by Convolution Methods: Introduction, Stability analysis of closed–loop systems in the z–plane, Transient and steady state response analysis, Design based on the root–locus method, Design based on the frequency–response method, Analytical design method.

State–Space Analysis: Introduction, State–space representations of discrete–time systems, Solving discrete–time state–space equations, Pulse transfer function matrix, Discretization of continuous time state space equations, Liapunov stability analysis, Controllability, Useful transformations in state–space analysis and design, Design via pole placement, State observer, Servo systems.

Quadratic Optimal Control Systems: Introduction, Quadratic optimal control, Steady–state quadratic optimal control, Quadratic optimal control of a servo system.

COURSE LEARNING OUTCOME (CLO): The student will be able to

1. Explain the basic concepts of nonlinear control systems.
2. Illustrate the concept and methods of optimal control.
3. Analyze and represent control systems in discrete domain.
4. Represent and analyze the control system in state space domain.

Text Books:

1. *Bandyopadhyay, M.N., Control Engineering: Theory and Practice, Prentice–Hall of India Private Limited (2003).*
2. *Ogata, K., Discrete–time Control Systems, Pearson Education (2005).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	25